

United States Department of Agriculture
Agricultural Research Administration
Bureau of Entomology and Plant Quarantine

STUDIES ON LINDANE RESIDUES IN MILK WHEN APPLIED
IN DAIRY BARNs AND ON DAIRY COWS

Prepared by Bureau of Entomology and Plant Quarantine,
Cornell University, and Rutgers University^{1/}

Lindane has been found by various investigators to be an effective residual insecticide for the control of the house fly (Musca domestica L.), including strains resistant to DDT. This is the common name for a chemical containing not less than 99 percent of gamma isomer of benzene hexachloride. It has also been demonstrated to be effective against Sarcoptes and Choroptes mites on dairy animals, and generally superior to other treatments. Extensive investigations with lindane and other benzene hexachloride insecticides for the control of mange caused by these mites in dairy cattle were carried out for several years at Cornell University. The Federal Bureau of Animal Industry and various other research institutions have also shown that mixed-isomer grades of benzene hexachloride and/or lindane are effective for mange control of dairy and other livestock.

Technical benzene hexachloride contains several isomers, some of which possess an undesirable odor or are hazardous from the standpoint of chronic toxicity to man and animals. Lindane is practically free of odor and is considered less toxic chronically than the technical

^{1/} These investigations were undertaken in cooperation with the California Spray-Chemical Corporation and the Hooker Electrochemical Corporation. The work of the Bureau of Entomology and Plant Quarantine was under the immediate supervision of C. H. Condron and R. W. Wells, Kerrville, Tex. The investigations at Cornell University were carried out by H. H. Schwardt, D. W. Baker, and L. B. Norton, and those at Rutgers University were conducted by Elton J. Hansens. Most of the analytical work was done by the Hooker Electrochemical Corporation, although some analyses of milk were also made by the U. S. Food and Drug Administration.

Studies on the effect of the lindane treatments on the flavor or odor of milk were made by the Bureau of Dairy Industry, of the United States Department of Agriculture, the Department of Dairy Industry, Cornell University, and the Dairy Department, Rutgers University.

material containing mixed isomers. However, before it could be judged safe to use as a residual spray in dairy barns or as a treatment for mange on dairy cows, it was necessary to determine to what extent, if any, milk might become contaminated with lindane residues when the insecticide is employed for the purposes stated. Experiments to obtain information on this important question are reported in this publication.

Milk Contamination Resulting from the Spraying of Dairy Barns

In June 1949 ten dairy barns in the vicinity of Kerrville, Tex., and four near New Brunswick, N. J., were sprayed with lindane so as to give a calculated deposit of 25 mg. of lindane per square foot of surface. A 25-percent lindane wettable-powder formulation and a 20-percent lindane emulsion concentrate furnished by the California Spray-Chemical Corporation were used in these tests. The wettable powder was used at the rate of 8 pounds and the emulsion at the rate of 5 quarts per 100 gallons of water. The sprays were applied with power sprayers operating at pressures of approximately 100 pounds per square inch.

Four barns, two each in Texas and New Jersey, were sprayed with the wettable powder, the feed troughs being covered. Four other barns, two in each location, were similarly treated with an emulsion. The remaining six barns, in Texas, were sprayed without special precautions, that is, the walls, ceiling, and stanchions were sprayed without covering the feed troughs. Three of these barns were treated with the wettable-powder and three with the emulsion spray. Cows and other livestock were removed from all the barns before they were sprayed.

Composite milk samples for chemical analysis and taste and odor tests were taken from each dairy herd milked in the treated barns. Check samples were taken 3 days before and on the morning before sprays were applied. In all tests samples were taken 1, 3, 7, and 14 days after treatment of the barns. Samples were also taken from two herds on the 21st and 28th days after the barns were treated.

The samples were analyzed by the Hooker Electrochemical Company employing slight modifications of the method described by Frawley and Davidow (1). The Food and Drug Administration also analyzed some samples of the milk. None of the analyses showed lindane in the milk. No adverse odor or flavor attributable to lindane was detected in the milk.

Milk Contamination Resulting from the Spraying of Dairy Cows

At Cornell University several cows were thoroughly treated with a spray containing 1 1/2 pounds of 25-percent lindane wettable powder per 100 gallons of water or a 0.046-percent lindane spray. This is the concentration recommended by Cornell University for mange control.

Milk samples were taken from the sprayed cows 1, 2, 3, 5, and 7 days after treatment, and analyzed for lindane content. The milk averaged 1.6 p.p.m. of lindane on the first day, 0.6 p.p.m. on the second day, and 0.3 p.p.m. on the third day after treatment. On the fifth and seventh days the lindane fell below 0.2 p.p.m., which is considered the limit of accuracy of the test method.

At Kerrville four cows were thoroughly treated with lindane. One was treated with approximately 2 gallons of a 0.03-percent lindane spray. At the same time 100 mg. of lindane was added to the feed, the amount that might be injected if feed were to become contaminated when barns are sprayed. On the first day after treatment the milk showed 0.6 p.p.m. of lindane present. By the third day no lindane could be detected in the milk. A second cow was treated with 0.05-percent lindane spray. The lindane content of the milk on various days after treatment was as follows: First day 1.0 p.p.m., second day 0.3 p.p.m., third day 0.4 p.p.m., fifth day 0.2 p.p.m., and seventh day none. Since the limit of accuracy of the test method is about 0.2 p.p.m., it is not certain that the milk on the fifth day contained lindane. Two cows were also treated with a 0.1-percent lindane spray. This is more than twice the concentration employed for mange control. The average lindane content of the milk after treatment was as follows: First day 2.0 p.p.m., second day 0.6 p.p.m., third day 0.4 p.p.m., fifth day 0.2 p.p.m., seventh day less than 0.1 p.p.m.

Samples of milk from the cows treated at Cornell University were tasted by investigators in the University's Department of Dairy Industry, and those from the cows treated at Kerrville were tasted by specialists in the U. S. Bureau of Dairy Industry. No unpleasant odor or flavor attributable to lindane were detected in the milk.

Over 100,000 dairy cattle in New York State have been treated for mange control during the last 2 years. These treatments proved highly successful from the standpoint of mange control. No harmful effect on animals or on the quality of the milk was apparent.

Current Recommendations for Use of Lindane in Dairy Barns and on Dairy Cows

On the basis of the data obtained from the investigations reported, the Bureau of Entomology and Plant Quarantine and many of the States have recommended lindane for use as a residual spray for fly control in dairy barns and milk rooms. The method of use and precautions suggested by the Bureau were outlined in a special release dated July 12, 1949, entitled "An Additional Residual Insecticide for Fly Control in Dairy Barns." The U. S. Food and Drug Administration, after considering the available data, posed no objection to the use of lindane as outlined.



As noted in the foregoing discussion, when lindane is applied to dairy cows for mange control small amounts of lindane appear in the milk. However, its presence in milk is of short duration, and little or none of the chemical can be detected after the third day. For mange control on dairy cows, current recommendations in New York State specify a maximum of two treatments 1 week apart. Since any milk that might contain small amounts of lindane from animals treated for mange will represent only a small part of all the milk entering a milk shed, it is apparent that milk entering the trade will contain negligible amounts of lindane and create no health hazard to the consumer.

Lindane is also useful for the control of lice on dairy cows. The treatment of cattle for mange will at the same time control these pests. However, for the control of lice only, a single treatment with a spray containing 0.03 percent of lindane is recommended.

At the present time lindane is not recommended for controlling other external parasites of dairy cows. Control of flies and ticks may require repeated treatments over a period of several months. Information is lacking on the amount of residue that may be found in milk when lindane is used at the concentrations and frequency necessary for the control of such parasites.

Literature Cited

- (1) Frawley, J. P., and Davidow, B.
1949. An ultraviolet spectrophotometric method for the quantitative estimation of benzene hexachloride in milk. Assoc. Off. Agr. Chem. Jour. 32: 758-762.